Sinergi International Journal of Education
E-ISSN: 2988-4926
Volume. 3, Issue 3, August 2025
Page No: 139-152

OBE System Explanations – An Implementation of Cognitive Domain on Theory Course

Md. Foisal Haque[1]
[1]**International University of Business Agriculture and Technology, Bangladesh**
Correspondent: mhaque.ce@iubat.edu[1]

Received : July 10, 2025
Accepted : August 23, 2025
Published : August 31, 2025

Citation: Haque, Md.F., (2025). OBE System Explanations – An Implementation of Cognitive Domain on Theory Course. Sinergi International Journal of Education, 3(3), 139-152.

https://doi.org/10.61194/education.v3i3.273

ABSTRACT: This research explains the OBE (Outcome-Based Education) system by implementing cognitive domain levels in the geotechnical engineering theory course. For this reason, the two program outcomes (POs) are proposed to evaluate the performance of students by achieving the threshold value of course outcome (TVCO) to obtain marks of individual course outcome (CO) considered for the mid-term and final exams. The minimum 70 % mark obtained in an individual CO is considered for achieving the TVCO according to the grade point values of the grading system. Most students are not achieving TVCO because of improper knowledge of pre-requisite courses, the lower voice of the teacher, absent minds of students during class, lack of practice on complex problems at home, etc. So, some remedial measures are taken to overcome these limitations such as mandatory to compete for the pre-requisite courses before taking the relevant higher level course, using a mouth-piece to increase the voice of the teacher, sharing some interesting issues with students to remove absent mind, try to more practice by proper utilizing time in home, etc. However, there is a scope to enhance this research in the future by applying other domains of the OBE system to the theory and lab courses.

Keywords: Cognitive Domain, Course Outcome, Outcome-Based Education, Program Outcome, Threshold Value of Course Outcome.

INTRODUCTION

The OBE system can predict the level of students because of the involvement of brainstorming (Cognitive), realization (Affective), and physical activities (Psychomotor). In theory courses, the Cognitive and Affective domains are directly involved with various patterns of questions such as multiple choices, true or false, analysis and design basis, etc (A, 2014). Normally, these questions are given in the different exams such as mid-term, final, class test, quiz, etc. So, it is very easy to judge the level of students by following the OBE system. For this reason, this research explains the OBE system on the basis of the Cognitive domain by applying it to the theory course (i.e. Geotechnical Engineering II). A flow chart is addressed in Figure 1 for understanding the fundamental mechanism of the OBE system. Several studies (Chan & Chan, 2009; dr. preeti Oza

& J, 2021; Hoque, 2016; Yasmin et al., 2023) were performed to explain the basic mechanism of the OBE system. The application of the Cognitive domain of the OBE system in the Geotechnical Engineering theory course is a novel technique that presents the performance of students on individual course outcomes (CO). Also, this system can identify the remedial measures of unachievable idealized threshold value of each CO. Each CO is developed by corresponding teacher to consider the level of the Cognitive domain which is linked to the program outcome (PO).

Several aspects are related to the Cognitive domain such as oral reading practice of young students (Grønli et al., 2025), Meta data analysis (Brunner et al., 2025), primacy effect (Krieglstein et al., 2025), methodological approach (Yeh et al., 2025), etc. In most recent study (Vágvölgyi et al., 2025), the Cognitive domain was used to analyze adults low literacy skills. The Cognitive domain-based Meta analysis was performed to simulate learning in higher education (Chernikova et al., 2025). Also, the K-12 data was used for the literacy education research (Fagerlund et al., 2025). The impact of pandemic on student performance was addressed in the case of the school level in North Carolina (Fuller et al., 2024). Some issues are impact on the Cognitive domain performance such as problem-solving errors (Zhang & Fiorella, 2024), virtual learning impact on the higher education (Santilli et al., 2025), hybrid brainstorming (Farrokhnia et al., 2025), AI-aided screening (Konig et al., 2024), etc. Several studies (Bergdahl & Sjöberg, 2025; Kinder et al., 2025; Landers, 2025; Ma, 2025; Tan et al., 2025; Valeri et al., 2025) used artificial intelligence to represent educational system. An inquiry-based science education was applied for the science teacher education in the period of 2000 to 2022 (Strat et al., 2024).

The self-regulated learning was used for the assessment of student's perceptions (Schellekens et al., 2024). Some issues are involved to the higher education such as high-quality practicum (Jenssen & Haara, 2024), online learning (Gorman & Hall, 2024), professional development (Mah & Groß, 2024), sustainability (Nguyen et al., 2025), etc. The motivation and innovation are the important terms of the Cognitive domain. Some studies (Andersen et al., 2025; Malisić et al., 2025; Motohashi et al., 2025; Wesenberg et al., 2025) implemented these terminologies in their researches. An institution achievement depends some issues such as re-framing design in education (Clark et al., 2024), qualitative research methodology (Castro et al., 2025), local barriers (Hadden et al., 2025), reclaiming the right to look (Woods et al., 2024), etc. Some factors influence the Cognitive domain terminologies such as research (Duff et al., 2024), theory-based approach (Hwang & Chang, 2024), educational model (Li et al., 2024), etc.

Previously, the OBE system was implemented in the industrial training program with the involvement of students (Osman et al., 2009), e-learning for enhancing teaching and learning (Akir et al., n.d.), development curriculum of university (Zeynal et al., 2017; Zulfadli et al., 2014), etc. This system was applied to the course to attain the CO and PO (Masni-Azian et al., 2014), and three domains (Cognitive, Affective, and Psychomotor) of the OBE system were implemented in the higher education course (Jesús et al., 2012). The OBE system was implemented in the primary school online courses in Indonesia to teach the mechanism of the Cognitive, Affective, and Psychomotor domains (Karta et al., 2023). Similarly, this system was applied to the specialized topic considering three domains (Khan, 2002). The Psychomotor domain was implemented in the concrete laboratory to evaluate the performance of students for practicing topics (Baharom et al.,

2015). Recently (Pranajaya et al., 2023), three domains have been implemented in Islamic Religion education to evaluate the scoring. Therefore, the OBE system is the appropriate method for properly evaluating the factional levels of students, universities, projects, etc.

In this research, the fundamental mechanism of the OBE system is explained by applying the Cognitive domain to the theory course. For this reason, sample question patterns of the mid-term and final exams are attached in Appendix A, and student performance is addressed in Appendix B. The total number of COs is mentioned to be six (6) which are linked to the three POs. The COs and POs fulfill each level of the Cognitive domain of the OBE system. Finally, remedial measures are given for not achieving the threshold value of course outcome (TVCO) which is applicable for the students and teacher to overcome mistakes of this course (Geotechnical Engineering II) in the future.

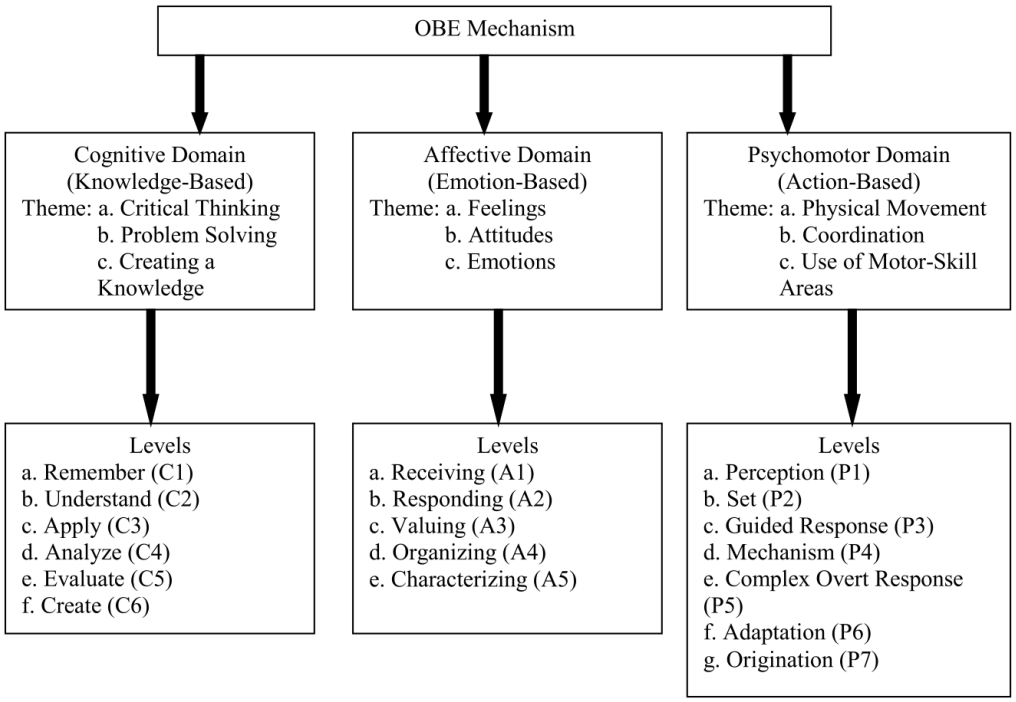

Figure 1. Flow diagram of the OBE mechanism.

Cognitive Domain Details with Grading System

The cognitive domain is divided into six levels such as remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6). In a previous study (Hoque, 2016), these six levels were defined in a triangular format. In this research, these six cognitive domain levels are dependent on the six individual CO. For assessing the industrial training program (Osman et al., 2009), the six COs were used for the preparation of the CO and PO matrix. These COs of this research are related to the three individual POs that are listed in Table 1. The course content details along with COs, POs, and cognitive levels are presented in Table 2. The course content details are selected based on the general considerations of foundation engineering (Geotechnical Engineering II) because it is necessary for solving practical problems. (König et al., 2024)The grading system is addressed in Table 3 for the evaluation of student's performance of

the theory course in this study. Also, the cognitive domain levels are dependent on the complex engineering problem mapping along with the knowledge profile according to the B.A.E.T.E. (2022) manual (Edition 2.1). So, the knowledge profile details along with the complex engineering problems and activities are shown in Table 4.

Table 1. Details explanation of POs used in this research.

Number of PO's	Details Explanation	Reference
PO 1	Ability to acquire and apply knowledge of basic science and engineering fundamentals.	Osman et al., 2009
PO 2	Ability to analytical depth of engineering structures.	Proposed
PO 3	Ability to create innovative formulations for solving engineering problems.	Proposed

Table 2. Details of course contents along with program and course outcomes.

Course Contents	Course Outcome (CO)	Program Outcome (PO)	Cognitive Domain Levels
Definition of various types of foundations	CO1	PO1	C1 (Remember)
Functional mechanism of various types of foundations	CO2		C2 (Understand)
Application of empirical and analytical formulations	CO3	PO2	C3 (Apply)
Analyze various types of foundations	CO4		C4 (Analyze)
Design various types of foundations	CO5	PO3	C5 (Evaluate)
Propose new analytical formulations and analyze foundations then design	CO6		C6 (Create)

Table 3. Details of grading system.

Marks Range	Meaning	Symbol of Meaning	Letter Grade	Grade Points
90 – 100	Excellent	E	A	4.0
87 – 89	Very Good		B+	3.7
84 – 86	Very Good	VG	B	3.4
80 – 83	Very Good		B-	3.1
77 – 79	Good		C+	2.8
74 – 76	Good	G	C	2.5
70 – 73	Good		C-	2.2
65 – 69	Poor	P	D+	1.5
60 – 64	Poor		D	1.0
< 60	Fail	F	F	0.0

Table 4. Complex Engineering Problems Mapping along with Knowledge Profile (re-arranged after BAETE, 2022).

KP	Explanations	CEP	Explanations	CEA	Explanations

K1	Theory-based understanding of natural sciences	P1	Cannot resolved in-depth engineering knowledge (satisfies: K3, K4, K5, K6 or K8)	A1	Diverse resources: people, money, equipment, materials, information, and technologies
K2	Conceptual-based mathematics, numerical analysis, and statistics	P2	Conflicting technical, engineering, and other issues	A2	Interaction problems: conflicting, engineering, and other issues
K3	Theory-based formulations of engineering fundamentals	P3	Abstract thinking and depth of analysis required	A3	Engineering principles and research-based knowledge in novel ways
K4	Engineering specialist knowledge	P4	Infrequently encountered issues	A4	Consequences for society and the environment
K5	Engineering design in a practice area	P5	Standards and codes of practice for professional engineering	A5	Applying principles-based approach based on previous experiences
K6	Engineering practice (technology) in practice areas	P6	Involvement of stakeholders and conflicting requirements	/	/
K7	Ethics and Engineer's professional responsibility	P7	High-level problems including many component parts of sub-problems	/	/
K8	Engagement with research literature	/	/	/	/

Note: KP = Knowledge Profile; CEP = Complex Engineering Problems; CEA = Complex Engineering Activities; "/" = Information is not necessary.

Student's Performances on Theory Course based on OBE System

An individual student's performance has been evaluated by obtaining marks for each question of the mid-term and final exams. The question details of mid-term and final exam are addressed in Appendix A. The questions are prepared based on the considerations of COs and POs by maintaining the cognitive domain levels. A details list of students and their corresponding marks are shown in Appendix B. The percentage of achievement of the threshold value of course outcome (TVCO) with the corresponding number of COs is presented in Figure 2. In this research, the TVCO is considered to be 70 % because of the minimum requirement of graduation according to the grading system mentioned in Table 3. The calculation process of the percentage of achievement of the TVCO is expressed in Eq. (1). The percentage of obtaining marks of any CO is calculated by using Eq. (2). The TVCO is varied within a range of (0~30) % presented in Figure 2.

$$TVCO\ (\%) = \left({}^{N_{70\%}}/_{N_T}\right) \times 100\% \qquad (1)$$

$$CO\ (\%) = \left({}^{\sum M_o}/_{\sum M_T}\right) \times 100\% \qquad (2)$$

Where,

$TVCO\ (\%)$ = Percentage of achievement of threshold value of course outcome

$N_{70\%}$ = Number of students to obtain 70% marks of any CO

N_T = Total number of students

$\sum M_o$ = Summation of obtained marks of questions under individual CO

$\sum M_T$ = Summation of total marks of questions under individual CO

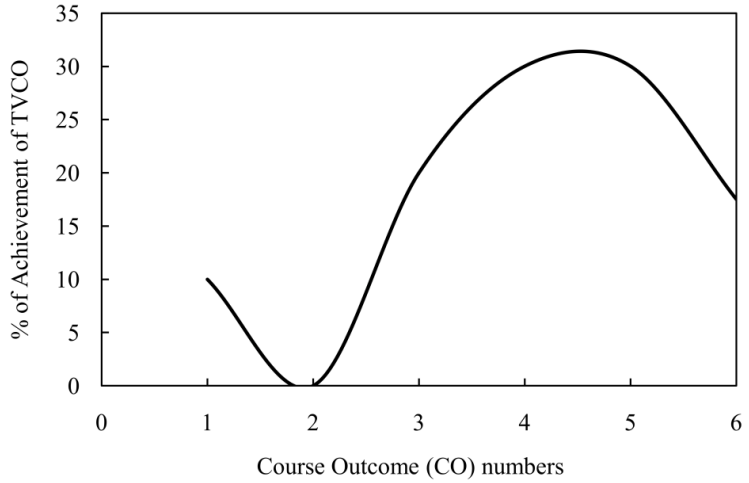

Figure 2. Representation of achievement of TVCO (%) with corresponding number of CO.

Reasons and Remedial Measures of not Achieving TVCO

The students' performances are not good according to the percentage of achievement of TVCO with corresponding CO numbers presented in Figure 2. Therefore, reasons and remedial measures for not achieving TVCO for individual CO are shown below:

CO1: The knowledge has not been transferred to the student properly because of the absence of mind in most of the students. Another reason is the theoretical questions decreasing the effectiveness of students. They do have not proper knowledge about the previous courses such as engineering drawing because most of the students fail to draw the foundation types. The voice and explanation techniques of the teacher are not clear. For this reason, most of the students may be not interested in learning from this topic after a certain period. Some techniques may improve this problem such as: a) more practicing and monitoring the civil engineering drawings during the course period, b) using the electric device and improving the presentation quality of lectures, c) controlling side talking of back benches students, d) performing friendly behaviors with the student, e) counseling with poor student at a specific time, etc.

CO2: The functional mechanisms of various types of foundations are related to the theory basis questions. Most engineering students are not interested in answering these theory questions because of the lengthy and lower marks compared to the other questions. Another reason is the language-based presentation materials of teachers. The fundamental solution to this problem is the development of thematic presentation along with theory by including pictures, online videos, animations, etc. Another solution is the collection of student responses after the end of each type of foundation functional mechanism.

CO3: In Geotechnical engineering, the empirical and analytical formulations are comparatively harder than the other civil engineering subjects. In the level of Bachelor of Science (BSc) in Engineering, the lengthy empirical and analytical formulations are not given in the question paper during the exam from the point of view of Bangladesh. An Engineering student may not expert in memorization. For these reasons, most students have forgotten those equations raising difficulties for solving these problems during exam hall. This problem can be minimized by preparing short forms of harder empirical and analytical formulations for supplying to students. The feedback from students is recorded for understanding to reach proper transfer of knowledge. The alternative solution is supplying equations during the exam by changing the conventional procedure of Bangladesh at the BSc level. The main focus of an engineering student is the capacity to understand relevant topics. So, this problem may be removed by ensuring a proper understanding of the basic mechanism of formulations by students.

CO4: The foundation analysis is related to the basic mechanism of solid mechanics and structural analysis. So, this part is difficult for those students whose are not understand clearly the general terminology of mechanics. Sometimes, these general terminologies are not focused on the lecture slides of geotechnical engineering because teachers assume that students already know these issues. This is the mistake of some teachers because all students have not the same capacity of the level of understanding. Another reason, some students are weak in analytical terminology so, they are afraid of mathematical formulations and solution mechanics. These problems may be solved by including real-world examples in the lecture slides. Also, mechanics and basic courses of the structure must be completed by students at a satisfactory level before taking this course. In addition, group discussion during class time may increase the level of basic mechanics and structure knowledge.

CO5: Design is related to the course "Reinforced Concrete", and analysis is linked with the course "Structural Analysis". So, students did not understand clearly the fundamental mechanism of the two pre-requisite courses because of improper utilization of time by students during class time and at home, unclear voice of the teacher during class time, incapable of students to take the lecture topics from the teacher, etc. To overcome this problem, it is required to include one or two fundamental lectures on design with the foundation analysis and design topics otherwise, this kind of phenomenon may gradually happen. Also, the teacher must ensure that his/her voice will be clear at the beginning of the class. In addition, it is mandatory for every student to more practice in their house every then it will be helpful for students to improve design-related problems.

CO6: The proposal of new analytical formulations is linked to the course "Fundamental Mathematics" which deals with the procedure of close-formed solutions by using integration and differentiation, and the mechanism of matrices for deriving finite element formulations by using

the stiffness matrix method. Also, the mechanism of the stiffness matrix method is related to the "Structural Analysis and Design". So, most students did not study these pre-requisite courses before taking this foundation course. The full concentration of students is required during the class time for this course. The teacher must ensure that students complete these pre-requisite courses satisfactorily while enrolling in the foundation course otherwise, it is very difficult to better outcome from this course. In addition, it is the responsibility of students to discuss every difficult topic with group mates (those who have a good understanding of every topic in this course) or teacher.

Appendix A

Exam Questions Pattern

Questions Pattern of Mid Term Exam

Course Title: Geotechnical Engineering II

Duration: 90 minutes

Full Marks: 100

Q.1 Define various types of foundations with neat sketch. [20, CO1/PO1/C1]

Q.2 Describes function of some foundations such as (a) square, (b) rectangular, and (c) triangular. [30, CO2/PO1/C2]

Q.3 Calculate the angle of internal frictional resistance if the field standard penetration number is 15. [20, CO3/PO2/C3]

Q.4 The field standard penetration number of a 5m depth sand deposit is found to be 9. Calculate the bearing capacity of an isolated column foundation at this depth. [30, CO3/PO2/C3]

Questions Pattern of Final Exam

Course Title: Geotechnical Engineering II

Duration: 180 minutes

Full Marks: 100

Q.1 Two columns are connected at the base by a single footing. The unfactored dead and live loads of each column are 250 kN and 400 kN, respectively. The bearing capacity of soil, unit weight of concrete, and size of the combined footing are 42 kPa, 24 kN/m^3, and 7000 mm x 9000 mm, respectively. Also, the thickness of footing and the size of both columns are found to be 750 mm and 400 mm x 600 mm, respectively. Analyze this foundation considering the height of columns of 3300 mm. Consider the center-to-center distance between two columns is 8000 mm. [25, CO4/PO2/C4]

Q.2 Design the foundation mentioned in Q.1 considering the floor arrangements on two columns. This floor consists of a single bed room, toilet, and verandah. The live load is considered according to the standard. The cylindrical compressive strength of concrete and yield strength of steel are taken to be 24 MPa and 420 MPa, respectively. Assume any reasonable data if necessary. [35, CO5/PO3/C5]

Q.3 Analyze the problem in Q.1 by developing the finite element formulations considering minimum 3-nodded line element. Consider any suitable data if required. [40, CO6/PO3/C6]

Appendix B

Student Identifications and Obtained Marks in Exam

B.1 Details history of student marks obtained in mid-term and final exams.

Serial No.	Student ID	Mid Term Exam Marks (Total 100)				Final Exam Marks (Total 100)		
		CO1	CO2	CO3	CO3	CO4	CO5	CO6
		C1	C2	C3	C3	C4	C5	C6
		PO1		PO2		PO2	PO3	
		Q.1	Q.2	Q.3	Q.4	Q.1	Q.2	Q.3
		20	30	20	30	25	35	40
1	4-1-0001	12	18	10	15	10	08	05
2	4-1-0002	10	08	12	20	15	20	12
3	4-1-0003	11	13	07	03	07	10	06
4	4-1-0004	14	15	08	22	20	30	35
5	4-1-0005	07	02	19	25	21	32	09
6	4-1-0006	09	07	11	16	15	17	16
7	4-1-0007	11	14	12	04	11	13	27
8	4-1-0008	04	12	04	06	12	06	13
9	4-1-0009	01	04	18	24	24	32	05
10	4-1-0010	06	09	07	14	13	21	31
11	4-1-0011	12	18	10	15	10	08	05
12	4-1-0012	10	08	12	20	15	20	12
13	4-1-0013	11	13	07	03	07	10	06
14	4-1-0014	14	15	08	22	20	30	35
15	4-1-0015	07	02	19	25	21	32	09
16	4-1-0016	09	07	11	16	15	17	16
17	4-1-0017	11	14	12	04	11	13	27
18	4-1-0018	04	12	04	06	12	06	13
19	4-1-0019	01	04	18	24	24	32	05
20	4-1-0020	06	09	07	14	13	21	31
21	4-1-0021	04	12	04	06	12	06	13
22	4-1-0022	01	04	18	24	24	32	05
23	4-1-0023	06	09	07	14	13	21	31
24	4-1-0024	12	18	10	15	10	08	05
25	4-1-0025	10	08	12	20	15	20	12
26	4-1-0026	11	13	07	03	07	10	06
27	4-1-0027	14	15	08	22	20	30	35
28	4-1-0028	07	02	19	25	21	32	09
29	4-1-0029	09	07	11	16	15	17	16
30	4-1-0030	11	14	12	04	11	13	27

31	4-1-0031	04	12	04	06	12	06	13
32	4-1-0032	10	08	12	20	15	20	12
33	4-1-0033	11	13	07	03	07	10	06
34	4-1-0034	14	15	08	22	20	30	35
35	4-1-0035	07	02	19	25	21	32	09
36	4-1-0036	09	07	11	16	15	17	16
37	4-1-0037	11	14	12	04	11	13	27
38	4-1-0038	04	12	04	06	12	06	13
39	4-1-0039	01	04	18	24	24	32	05
40	4-1-0040	10	08	12	20	15	20	12

CONCLUSION

This research addressed the simple explanations of the OBE system by implementing the cognitive domain in the geotechnical engineering theory course. For this reason, course contents are arranged by considering proposed POs. Each cognitive domain level is defined as an individual CO. A total 40 numbers of students' mid-term and final exam marks are addressed for evaluating performance to consider a minimum 70 % achievement of TVCO. Finally, reasons and remedial measures are provided for those students who are not achieving the minimum percentage of the TVCO. Therefore, the major findings are summarized herein:

- A diagram of the OBE system is mentioned in this research for easy understanding of the three domains (cognitive, affective, and Psychomotor) with their corresponding levels. The two POs are proposed in this research, and their impacts are evaluated from the percentage of achievement of the TVCO. The minimum 70 % achievement of TVCO is considered based on the value of grade points of the grading system.
- According to the reasons for not achieving TVCO, students didn't know enough information about the pre-requisite courses of the proposed theory course. Some students are talked together during class time which is difficult to control. Sometimes, the teacher's voice is not reached to the back bench students. Most students do not practice in the home of their assigned work after completing the everyday class. The TVCO may cross the minimum level if the reasons are overcome by following the proper remedial measures.

However, there is a scope to enhance the present study in the future by applying affective and Psychomotor domains to the theory and lab courses. Also, statistical analysis can be performed to predict the most vulnerable level of the cognitive domain.

REFERENCES

A, M.-A. (2014). Towards OBE: A Case Study of Course Outcome (CO) and Programme Outcome (PO) Attainment for Product Design and Development Course. *IOSR Journal of Research & Method in Education (IOSRJRME*, *4*(2), 55–61.

Akir, O., Eng, T. H., & Malie, S. (n.d.). Teaching and Learning Enhancement Through Outcome-Based Education Structure and Technology e-Learning Support. *Procedia - Social and Behavioral Sciences*, *62*, 87–92.

Andersen, J. P., Degn, L., Fishberg, R., Graversen, E. K., Horbach, S. P. J. M., Schmidt, E. K., Schneider, J. W., & Sørensen, M. P. (2025). Generative Artificial Intelligence (GenAI) in the research process – A survey of researchers' practices and perceptions. *Technology in Society*, *81*, 102813.

B.A.E.T.E. (2022). *Accreditation Manual for Undergraduate Engineering Programs*.

Bergdahl, N., & Sjöberg, J. (2025). Attitudes, perceptions and AI self-efficacy in K-12 education. *Computers and Education: Artificial Intelligence*, *8*, 100358.

Brunner, M., Stallasch, S. E., Artelt, C., & Lüdtke, O. (2025). An Individual Participant Data Meta-Analysis to Support Power Analyses for Randomized Intervention Studies in Preschool: Cognitive and Socio-Emotional Learning Outcomes. *Educational Psychology Review*, *37*(1), 6.

Castro, V. de, Martín-Peña, M. L., Martínez, E. M., & Salgado, M. (2025). Combining Action Research With Design Science as a Qualitative Research Methodology. *An Application to Service (Operations) Management Research. International Journal of Qualitative Methods*, *24*.

Chan, A., & Chan, C. (2009). A new outcome-based curriculum: its impact on student core competence. *Journal of Applied Research in Higher Education*, *1*(2), 24–32.

Chernikova, O., Sommerhoff, D., Stadler, M., Holzberger, D., Nickl, M., Seidel, T., Kasneci, E., Küchemann, S., Kuhn, J., Fischer, F., & Heitzmann, N. (2025). Personalization through adaptivity or adaptability? A meta-analysis on simulation-based learning in higher education. *Educational Research Review*, *46*, 100662.

Clark, D. B., Scott, D., DiPasquale, J. P., & Becker, S. (2024). Reframing design in education: Proposing a framework to support pre-service teachers in adopting designerly stances. *Journal of the Learning Sciences*, *33*(4–5), 613–666.

dr. preeti Oza, & J, D. G. P. (2021). Curriculum and Evaluation in Outcome-Based Education. *Psychology and Education Journal*, *58*(2), 5620–5625.

Duff, M., Glazer, J. L., Shirrell, M., & Freed, D. (2024). Walking a Tightrope: Navigating Principal-Agent Dilemmas in Research-Practice Partnerships. *Educational Evaluation and Policy Analysis*, *46*(4), 709–734.

Fagerlund, J., Palsa, L., & Mertala, P. (2025). Exploration of domains of educational purpose in K-12 data literacy education research. *Educational Research Review*, *46*, 100663.

Farrokhnia, M., Noroozi, O., Baggen, Y., Biemans, H., & Weinberger, A. (2025). Improving hybrid brainstorming outcomes with computer-supported scaffolds: Prompts and cognitive group awareness. *Computers & Education*, *227*, 105229.

Fuller, S. C., Swiderski, T., Mikkelsen, C., & Bastian, K. C. (2024). *In School, Engaged, on Track? The Effect of the Pandemic on Student Attendance, Course Grades, and Grade Retention in North Carolina*. Educational Researcher.

Gorman, A., & Hall, K. (2024). Exploring the impact of an online learning community to support student teachers on school placement. *European Journal of Teacher Education*, *47*(5), 1056–1072.

Grønli, K. M., Walgermo, B. R., McTigue, E. M., & Uppstad, P. H. (2025). *Feedback Practices on Young Students*. A Systematic Review. Review of Educational Research.

Hadden, I. R., Harris, P. R., & Easterbrook, M. J. (2025). Context matters: Diagnosing and targeting local barriers to success at school. *Journal of School Psychology*, *108*, 101401.

Hoque, M. (2016). Three Domains of Learning: Cognitive, Affective and Psychomotor. *Journal of EFL Education and Research (JEFLER*, *2*(2), 45–52.

Hwang, G.-J., & Chang, C.-C. (2024). *A self-determination theory-based digital gaming approach to enhancing EFL learners' competence in applying professional English*. Educational Technology Research and Development.

Jenssen, E. S., & Haara, F. O. (2024). High-quality practicum – according to teacher education students on their practicum at partnership schools. *European Journal of Teacher Education*, *47*(5), 876–894.

Jesús, A., Armando, K., & Claudia, D. (2012). Perceived cognitive, affective and psychomotor learning in a blended course in higher education. *Proceedings of EDULEARN12 Conference*, 6213–6220.

Karta, I. W., Farmasari, S., & Ocampo, D. M. (2023). Online Assessment of Primary Students' Cognitive, Psychomotor, and Affective Domains: Practices from Urban and Rural Primary Schools in Indonesia. *SHS Web of Conferences*, *173*, 1014.

Kinder, A., Briese, F. J., Jacobs, M., Dern, N., Glodny, N., Jacobs, S., & Leßmann, S. (2025). Effects of adaptive feedback generated by a large language model: A case study in teacher education. *Computers and Education: Artificial Intelligence*, *8*, 100349.

König, L., Zitzmann, S., Fütterer, T., Campos, D. G., Scherer, R., & Hecht, M. (2024). An evaluation of the performance of stopping rules in <scp>AI</scp> -aided screening for psychological meta-analytical research. *Research Synthesis Methods*, *15*(6), 1120–1146.

Krieglstein, F., Beege, M., Wesenberg, L., Rey, G. D., & Schneider, S. (2025). The Distorting Influence of Primacy Effects on Reporting Cognitive Load in Learning Materials of Varying Complexity. *Educational Psychology Review*, *37*(1), 2.

Landers, M. (2025). Adapting to the Unsanctioned Use of AI-Supported Technologies in Student Assessments. *Higher Education for the Future*, *12*(1), 76–96.

Li, Q., Moallem, M., Boettinger, J., Cai, Q., & Levi, M. (2024). *An educational model of equity and computing: a study of marginalized student experience during COVID pandemic*. Educational Technology Research and Development.

Ma, T. (2025). Systematically visualizing ChatGPT used in higher education: Publication trend, disciplinary domains, research themes, adoption and acceptance. *Computers and Education: Artificial Intelligence*, *8*, 100336.

Mah, D.-K., & Groß, N. (2024). Artificial intelligence in higher education: exploring faculty use, self-efficacy, distinct profiles, and professional development needs. *International Journal of Educational Technology in Higher Education*, *21*(1), 58.

Malisić, B., Tinaj, S., Popović, J., Lukovac, L., & Vlačić, B. (2025). Internal dynamics and innovation: A cross-disciplinary review and future research agenda. *Technology in Society*, *81*, 102773.

Motohashi, K., Ikeuchi, K., & Kwon, S. (2025). Impact of national university patenting on innovation: Researcher analysis in Japan. *Technology in Society*, *81*, 102806.

Nguyen, H., Nguyen, V., Ludovise, S., & Santagata, R. (2025). Value-sensitive design of chatbots in environmental education: Supporting identity, connectedness, well-being and sustainability. *British Journal of Educational Technology*.

Osman, S. A., Omar, M. Z. , Mat, K., & Kofli, N. T. (2009). *Outcome Based Education (OBE) Curriculum Assessment for Industrial Training Program: Based on Students' Perception.* .

Santilli, T., Ceccacci, S., Mengoni, M., & Giaconi, C. (2025). Virtual vs. traditional learning in higher education: A systematic review of comparative studies. *Computers & Education*, *227*, 105214.

Schellekens, L. H., Schaaf, M. F., Baartman, L. K. J., Vleuten, C. P. M., Kremer, W. D. J., & Bok, H. G. J. (2024). Students' perceptions of the assessment programme's impact on self-regulated learning: a multiple-case study. *Assessment & Evaluation in Higher Education*, *49*(8), 1074–1090.

Strat, T. T. S., Henriksen, E. K., & Jegstad, K. M. (2024). Inquiry-based science education in science teacher education: a systematic review. *Studies in Science Education*, *60*(2), 191–249.

Tan, X., Cheng, G., & Ling, M. H. (2025). Artificial intelligence in teaching and teacher professional development: A systematic review. *Computers and Education: Artificial Intelligence*, *8*, 100355.

Vágvölgyi, R., Bergström, K., Bulajić, A., Rüsseler, J., Fernandes, T., Grosche, M., Klatte, M., Huettig, F., & Lachmann, T. (2025). The cognitive profile of adults with low literacy skills in alphabetic orthographies: A systematic review and comparison with developmental dyslexia. *Educational Research Review*, *46*, 100659.

Valeri, F., Nilsson, P., & Cederqvist, A.-M. (2025). Exploring students' experience of ChatGPT in STEM education. *Computers and Education: Artificial Intelligence*, *8*, 100360.

Wesenberg, L., Jansen, S., Krieglstein, F., Schneider, S., & Rey, G. D. (2025). The influence of seductive details in learning environments with low and high extrinsic motivation. *Learning and Instruction*, *96*, 102054.

Woods, P. J., Matuk, C., DesPortes, K., Vacca, R., Tes, M., Vasudevan, V., & Amato, A. (2024). Reclaiming the right to look: making the case for critical visual literacy and data science education. *Critical Studies in Education*, *65*(5), 441–459.

Yasmin, F., Farooq, M. U., & Shah, S. K. (2023). Impact of Exam-Oriented Education System on Undergraduate Students' Cognitive, Affective and Psychomotor Competencies. *International Journal of Linguistics and Culture*, *4*(1), 109–125.

Yeh, C., Reinholz, D. L., Lee, H. H., & Moschetti, M. (2025). Beyond Verbal: A Methodological Approach to Highlighting Students. In *Embodied Participation in Mathematics Classroom*. Educational Researcher.

Zeynal, H., Zakaria, Z., Anisseh, M., & Mansoorzadeh, S. (2017). Strategic implementation of outcome-based education system in Buein-Zahra Technical University of Iran. *2017 IEEE 9th International Conference on Engineering Education (ICEED*, 122–127.

Zhang, Q., & Fiorella, L. (2024). Effects of self-explaining feedback on learning from problem-solving errors. *Contemporary Educational Psychology*, *79*, 102326.

Zulfadli, Mokhtar, S. A., Puteh, S., & Anuar, S. M. S. (2014). *OBE Measurement System in Malaysian Institute of Information Technology Universiti Kuala Lumpur*.